MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

PPH0255 – PHYSICS

(Foundation in Information Technology)

2 March 2019
9.00 A.M – 11.00 A.M
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 printed pages with 5 questions only, excluding the cover page, physical constants, and formula list.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

LIST OF PHYSICAL CONSTANTS

Acceleration due to gravity	g	$9.80\ \text{m/s}^2$
Electron mass	m_e	$9.11 \times 10^{-31}\ \text{kg}$
Proton mass	m_p	$1.67 \times 10^{-27}\ \text{kg}$
Elementary Charge	e	$1.602 \times 10^{-19}\ \text{C}$
Coulomb Constant	k	$9.0 \times 10^{9}\ \text{N m}^2.\ \text{C}^{-2}$
Permittivity of free space	ε_0	$8.85 \times 10^{-12}\ \text{C}^2\ \text{N}^{-1}.\text{m}^{-2}$

LIST OF FORMULA

NEWTONIAN MECHANICS

$$\omega = \frac{\Delta\theta}{\Delta t} \qquad v = r\omega \qquad a = r\alpha$$

$$\omega = \omega_o + \alpha t \qquad \theta = \frac{1}{2}(\omega_0 + \omega)t \qquad \theta = \omega_0 t + \frac{1}{2}\alpha t^2$$

$$\omega^2 = \omega_0^2 + 2\alpha\theta \qquad \theta = \omega t - \frac{1}{2}\alpha t^2$$

$$W = Fs\cos\theta \qquad KE = \frac{1}{2}mv^2 \qquad PE_G = mgy$$

$$P = \frac{W}{t} = \frac{E}{t} = \frac{Fd}{t} = F\bar{v} \qquad p = mv \qquad \sum F = \frac{\Delta p}{\Delta t}$$

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2 \qquad m_1u_1 + m_2u_2 = (m_1 + m_2)\,v$$

ELECTRICITY

$$q = Ne \qquad F = k\frac{q_1 q_2}{r^2} \qquad E = \frac{F}{q_o}$$

$$E = k\frac{q}{r^2} \qquad \Phi = EA\cos\theta \qquad \Phi_c = \frac{q_{in}}{\varepsilon_o}$$

$$V = \frac{U}{q_o} \qquad V = \frac{kq}{r} \qquad U = k\frac{q_1 q_2}{r_{12}}$$

$$C = \frac{\varepsilon_0 A}{d} \qquad Q = CV \qquad C = \kappa C_0$$

$$C_{eq} = C_1 + C_2 + ... \qquad \frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + ... \qquad V = E\,d$$

$$U = \tfrac{1}{2}\,QV \qquad U = \tfrac{1}{2}\,CV^2 \qquad U = \frac{Q^2}{2C}$$

$$u_E = \tfrac{1}{2}\,\varepsilon_o E^2 \qquad I_{av} = \frac{\Delta Q}{\Delta t} \qquad V = IR$$

$$R = \rho\frac{L}{A} \qquad R_{eq} = R_1 + R_2 + ... \qquad \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + ...$$

$$P = IV \qquad P = I^2 R \qquad P = \frac{V^2}{R}$$

$$V = E - Ir$$

STRUCTURED QUESTIONS [50 MARKS]

Instructions: Answer **ALL** questions in this section.

Question 1 [10 marks]

a. A wheel rotates with a constant angular acceleration of 5.00 rad/s^2 . If the angular speed of the wheel is 3.50 rad/s at $t_i = 0$,

i. through what angle does the wheel rotate between $t = 0$ and $t = 2.00$ s? Give your answer in radians and revolutions. (2 marks)

ii. What is the angular speed of the wheel at $t = 2.00$ s ? (2 marks)

b. The disk in a computer disk drive spins up to 5400 rpm in 2.00 s.

i. What is the angular acceleration of the disc, assuming the angular acceleration is uniform? (2 marks)

ii. At the end of 2.00 s, how many revolutions has the disk made? (4 marks)

Question 2 [10 marks]

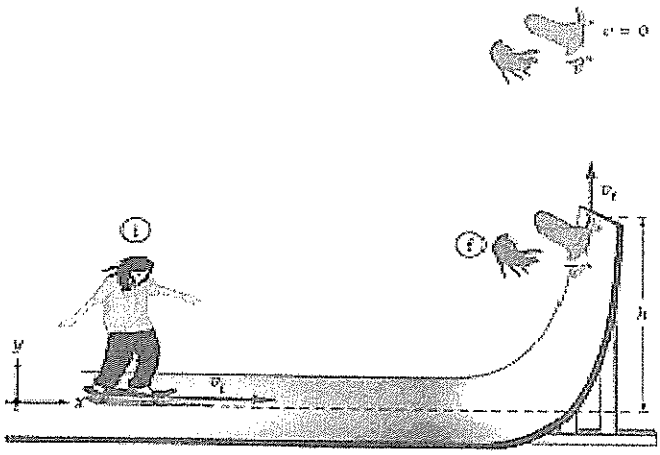

Figure Q2(a)

a. **Figure Q2(a)** shows a 50.0 kg skateboard enters a ramp moving horizontally with a speed of 6.0 m/s, and leaves the ramp moving vertically with a speed of 4.0 m/s.' (Note: Choose $y = 0$ to be the level of the bottom of the ramp.)

i. Find the height of the ramp, h, assuming no energy loss due to frictional forces. (3 marks)

ii. What is the skateboard's maximum height above the bottom of the ramp? (2 marks)

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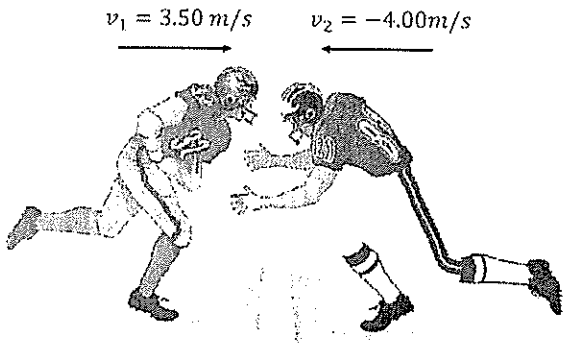

Figure Q2(b)

b. **Figure Q2(b)** shows on the touchdown attempt, a 90.0 kg running back runs toward the end zone at 3.50 m/s. A 110.0 kg linebacker moving at 4.00 m/s meets the runner in a head-on collision. If the two players stick together,

i. what is their velocity immediately after the collision? (2 marks)

ii. What are the initial and final kinetic energies of the system? (3 marks)

Question 3 [10 marks]

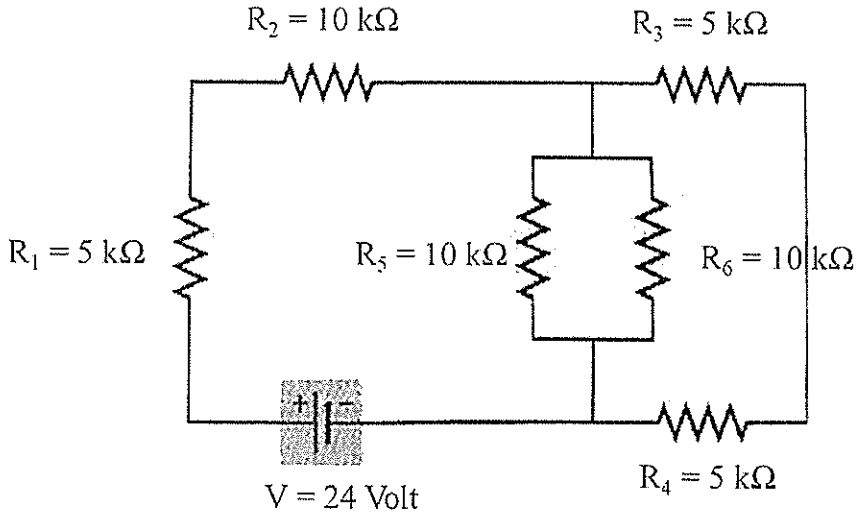

Figure Q3

For the circuit in **Figure Q3** calculate,

a. the equivalent resistance (4 marks)

b. the current flowing through the R_2 resistor (2 marks)

c. the potential difference across the R_5 resistor (2 marks)

d. the power dissipated by the R_6 resistor (2 marks)

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Question 4 [10 marks]

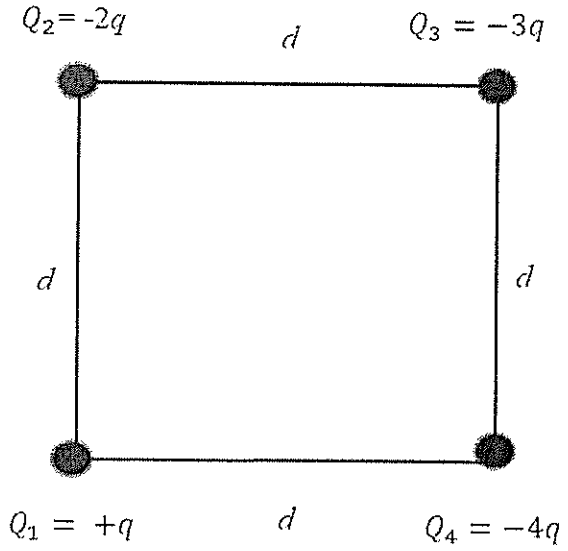

Figure Q4

Four point charges are located at the corners of a square with sides of length, $d = 33.0$ cm. (**Figure Q4**)

a. Find the direction and the magnitude of the net electrostatic force exerted on the point charge Q_3. Let $q = 2.0$ μC (8 marks)

b. How would your answers to part 4(a) change if the distance d were doubled? (2 marks)

Question 5 [10 marks]

a. Define '*free electrons*' and '*valence electrons*'. (1mark)

b. With the aid of a diagram, describe the formation of holes in a *p*-type semiconductor. (3 marks)

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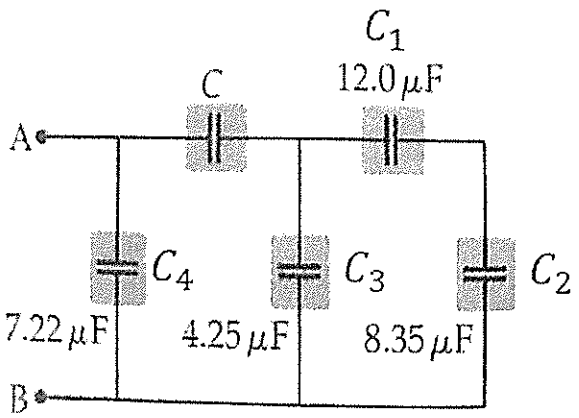

Figure Q5(c)

c. Five capacitors are connected as shown in **Figure Q5(c).** The equivalent capacitance of the capacitors is 9.22 μF. Find the value of the capacitance C.

(6 marks)

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